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WO 03/058002

PCT/NZ02/00222

**AN IMPROVED TOILET AND FLUSHING SYSTEM****TECHNICAL FIELD**

This invention relates to an improved toilet flushing system and includes methods for flushing and manufacture of the improved toilet.

**5 BACKGROUND ART**

The common gravity fed toilet system known today which utilises a toilet bowl connected to a cistern has the following disadvantages:

- 10 \* It requires a reservoir or cistern to be full of water to enable it to flush, thus a toilet cannot be re-flushed immediately after a flush, until the cistern has been refilled.
- \* It requires a large volume of water for the toilet to flush properly and completely so that no waste residue is left in the bowl of the toilets.
- \* It can take a considerable amount of time for the flushing to be completed.
- \* The toilet when flushed generates a substantial amount of noise.
- 15 \* The toilet cistern when filling, often also creates a substantial amount of noise.
- \* The cistern requires several moving parts and washers so that it can operate, making it prone to mechanical failure and unnecessary water wastage due to leaking washers or other faulty parts. Furthermore, the ball cock valves often employed within a cistern can be notoriously unreliable in terms of their  
20 operation.

In the United States of America common gravity fed toilets, when flushed, fill the bowl nearly completely with water. Thus, during the initial flush when the bowl is emptied these toilets can be relatively quiet. However, a major drawback with these toilets is that

WO 03/058002

PCT/NZ02/00222

2

they utilize a large volume of water and still require a cistern in order to operate. They are therefore still noisy when the cistern refills.

Other toilets which require no cistern often utilize an extended vertical pipe within the wall cavity as a reservoir. However, such toilets are still noisy when flushed.

- 5 All references, including any patents or patent applications cited in this specification are hereby incorporated by reference. No admission is made that any reference constitutes prior art. The discussion of the references states what their authors assert, and the applicants reserve the right to challenge the accuracy and pertinency of the cited documents. It will be clearly understood that, although a number of prior art
- 10 publications are referred to herein, this reference does not constitute an admission that any of these documents form part of the common general knowledge in the art, in New Zealand or in any other country.

- It is acknowledged that the term 'comprise' may, under varying jurisdictions, be attributed with either an exclusive or an inclusive meaning. For the purpose of this
- 15 specification, and unless otherwise noted, the term 'comprise' shall have an inclusive meaning - i.e. that it will be taken to mean an inclusion of not only the listed components it directly references, but also other non-specified components or elements. This rationale will also be used when the term 'comprised' or 'comprising' is used in relation to one or more steps in a method or process.

- 20 It is an object of the present invention to address the foregoing problems or at least to provide the public with a useful choice.

Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

#### **DISCLOSURE OF INVENTION**

- 25 According to one aspect of the present invention there is provided an improved toilet and flushing system, wherein the system includes;

WO 03/058002

PCT/NZ02/00222

3

- a toilet bowl; and
  - a pressured water supply;
  - at least one flow regulator;
  - at least one water outlet;
- 5 characterized in that the system includes at least one control device configured to operate said flow regulator(s) to control the flow of the pressured water supply, and wherein the outlet(s) are configured to deliver water from the pressured water supply, so that water from the pressured water supply:
- a) creates a venturi effect to evacuate waste and water from the bowl;
- 10 b) travels along wall(s) of the toilet bowl to wash and refill the toilet.

In preferred embodiments the water from the water supply may enter the bowl via at least two top outlets and at least one bottom outlet. However, this should not necessarily be seen as limiting.

- In general, the control device may be operably connected to the flow regulator, such that
- 15 when the control device is activated to flush the toilet, the control device is configured to operate the flow regulator so that:

- a) water from water supply can enter the bowl from the bottom outlet for a predetermined period of time; and
- b) water from water supply can then enter the bowl from the two top outlets for  
20 a predetermined period of time; and then
- c) the water supply to the bowl is shut off, until the control device is reactivated to flush the toilet:

wherein said bottom outlet is configured to create a venturi effect capable of evacuating waste and water from the bowl, and wherein said top outlets are positioned about the top

WO 03/058002

PCT/NZ02/00222

4

of the bowl and are configured to direct water on to the wall of the bowl, so that water can travel along the wall(s) of the bowl to wash and refill the toilet.

According to a further aspect of the present invention there is provided an improved toilet and flushing system, wherein the system includes:

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a toilet bowl; and

a pressured water supply;

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the system characterized in that the toilet bowl is adapted so that water from the water supply can enter the bowl, via at least two top outlets and at least one bottom outlet, wherein the system also includes at least one control device operably connected at least one flow regulator, to regulate the flow of water from the water supply to the bowl, such that when the control device is activated to flush the toilet, the control device is configured to operate the flow regulator so that:

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- a) water from water supply can enter the bowl from the bottom outlet for a predetermined period of time; and
- b) water from water supply can then enter the bowl from the two top outlets for a predetermined period of time; and then
- c) the water supply to the bowl is shut off, until the control device is reactivated to flush the toilet;

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wherein said bottom outlet is configured to create a venturi effect capable of evacuating waste and water from the bowl, and wherein said top outlets are positioned about the top of the bowl and are configured to direct water on to the wall(s) of the bowl, so that water can travel along the wall(s) of the bowl to wash and refill the toilet.

According to another aspect of the present invention there is provided an improved toilet and flushing system, substantially as described above, wherein the system utilises

WO 03/058002

PCT/NZ02/00222

5

two flow regulators, a first flow regulator to control the flow of water to the bottom outlet, and a second flow regulator to control the flow of water to the top outlets.

According to a further aspect of the present invention there is provided an improved toilet and flushing system, substantially as described above wherein the top outlets are  
5 positioned about the top of the bowl, such that water when exiting the outlets, travels around and down the walls of the bowl in a substantially clockwise or anti-clockwise direction.

Accordingly to a further aspect of the present invention there is provided a method for flushing a toilet comprising the steps of:

- 10       a) controlling the flow of a pressured water supply to a toilet bowl;
- b) delivering the pressured water supply to the toilet bowl so that water from the pressured water supply:
- i) creates a venturi effect to evacuate waste and water from the bowl; and
- ii) travels along wall(s) of the toilet bowl to wash and refill the toilet.

15       According to a further aspect of the present invention there is provided a method for flushing a toilet comprising the steps of:

- a) providing water to at least one bottom outlet, for a predetermined period of time, wherein said outlet is positioned in the base of the toilet bowl and configured to achieve a venturi effect capable of evacuating waste and water  
20       from the bowl; and then
- b) providing water to at least two top outlets for a predetermined period of time wherein said outlets are positioned at the top of the toilet bowl and are configured so that water is directed onto the walls of the toilet bowl; and then
- c) stopping the flow of water to the outlets to complete the flush cycle.

WO 03/058002

PCT/NZ02/00222

6

Preferably, the venturi effect leaves the bowl empty.

According to a further aspect of the present invention there is provided a method of manufacturing a toilet comprising the steps of:

- 5
- a) providing at least one water outlet in the base of a toilet bowl wherein said outlet is configured to achieve a venturi effect when operated;
  - b) providing at least two water outlets about the top of a toilet bowl configured to direct water on to the wall(s) of the bowl.

According to another aspect of the present invention there is provided a kit for a toilet and flushing system which includes:

- 10
- a) at least one water outlet in the base of a toilet bowl wherein said outlet is configured to achieve a venturi effect when operated;
  - b) at least two water outlets about the top of a toilet bowl configured to direct water on to the wall(s) of the bowl.
  - c) at least one flow regulator to regulate the flow of water from the water supply to said outlets;
  - d) at least one control device to activate and deactivate at least one flow regulator.
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According to another aspect of the present invention there is provided an improved toilet and flushing system, wherein the system includes:

- 20
- a toilet bowl; and
  - a pressured water supply;

the system characterized in that the toilet bowl is adapted so that water from the water supply can enter the bowl, via at least two top outlets and at least one bottom outlet, wherein the system also includes at least one control device, operably connected to at

WO 03/058002

PCT/NZ02/00222

7

least one flow regulator to regulate the flow of water from the water supply to the bowl, such that when the control device is activated, to flush the toilet, the control device is configured to operate the flow regulator so that

- 5 a) water from water supply enters the bowl from the two top outlets for a predetermined period of time; and
- b) water from water supply then enters the bowl from the bottom outlet for a predetermined period of time; and
- c) water from the water supply then re-enters the bowl from the two top outlets for a further predetermined period of time; and then
- 10 d) the water supply to the bowl is shut off until the control device is reactivated to flush the toilet;

wherein said bottom outlet is configured to create a venturi effect capable of evacuating waste and water from the bowl, and wherein said top outlets are positioned about the top of the bowl and are configured to direct water on to the wall(s) of the bowl, so that

15 water can travel along the wall(s) of bowl when the toilet is filled.

The toilet bowl may have a variety of configurations without departing from the scope of the present invention.

Generally, the toilet bowl may include a rim; a base. The toilet is usually also connected to a P or S trap and is connected to a mains sewer system, septic tank or other

20 waste reservoir in the normal manner.

The term "pressured water supply" refers to a source of water which can be supplied at pressure.

In preferred embodiments the pressured water supply may be a mains water supply.

WO 03/058002

PCT/NZ02/00222

8

In general, the mains water supply may have a water pressure of at least substantially 30-70 PSI. Preferably, the water pressure of the mains water supply may be substantially 30 PSI.

5 However, other types of pressured water supply may be utilised without departing from the scope of the present invention, provided they supply water to the toilet at a water pressure substantially as outlined above.

The water outlets may have a variety of different configurations without departing from the scope of the present invention.

In general, the water outlets may be any suitable nozzle, opening or such like.

10 Preferably the top outlets are configured to allow for water to be directed onto the top of the wall(s) of the toilet.

The number of top outlets used in the present invention may vary without departing from the scope of the present invention.

Generally, at least two top outlets may be utilised in the present invention.

15 Preferably, three top outlets may be utilised in the present invention.

The term "venturi effect" as used herein refers to the reduction in pressure or vacuum created by an increase of fluid flow velocity.

In preferred embodiments, the venturi effect may be created by:

- 20 a) water exiting the bottom outlet through a tapered end portion which increases the velocity of the water; and
- b) the water exiting the bottom outlet such that it is directed towards the back of the bowl to a point approximately 5 cm above the outlet;

such that water and waste are sucked out of the bowl to leave the bowl empty.



WO 03/058002

PCT/NZ02/00222

9

However, this should not be seen in limiting the scope of the present invention as the venturi effect may also be achieved via other means.

The flow regulators may have a variety of configurations without departing from the scope of the present invention.

- 5 Generally, the flow regulators may comprise an on/off valve or such like. However, this should not be seen as limiting the present invention.

In one preferred embodiment the flow regulator may be a solenoid valve having an inlet and two outlets wherein the valve is configured to be capable of:

- a) directing water to either a first or second outlet from said valve; and  
10 b) shutting off the water supply to both outlets.

In another preferred embodiment there may be provided two flow regulators in the form of solenoid (on/off) valves each having an inlet and an outlet. In general the solenoid valve may be any suitable solenoid valves as would be readily apparent to a person skilled in the art. For example, the solenoid valves may substantially be the same as  
15 those used in domestic appliances such as dishwasher and the like.

The control device may have a variety of configurations without departing from the scope of the present invention.

Generally, the control device may consist of any device which is configured to be capable of operating at least one flow regulator in the desired manner, over a  
20 predetermined time period.

In one preferred embodiment the control device may be an electronic timing device capable of being configured to operate at least one flow regulator in a desired manner over a predetermined time period.

WO 03/058002

PCT/NZ02/00222

10

Most preferably, the control device may be capable of being adjusted to allow for the flow regulators to be operated at different predetermined times depending on the pressure of the pressured water supply.

5 In some embodiments the control device may be or include a suitably programmable logic unit such as a CPU.

In some further embodiments the control device may sense the pressure of the water supply and may adjust the predetermined times the flow regulator(s) remain open accordingly.

10 In one embodiment the predetermined time that the flow regulator is opened for the bottom outlet is substantially 8 seconds when the mains pressure is at substantially 30-60 PSI so as to allow for the bowl to be evacuated.

In another preferred embodiment the predetermined time that the flow regulator is opened for the top outlet is substantially 3 seconds when the mains pressure is at 30-60 PSI so as to allow for the bowl to be evacuated.

15 The inventor has found these parameters to be very economical in terms of water use such that only 3-4 litres of water is required per flush.

However, it will be clear to those skilled in the art that the flow regulators may remain open for different predetermined times dependent on the mains pressure from which the system is being operated, and/or the order in which the flow regulators are operated.

20 In general, water is supplied to the top and bottom outlets via separate conduits that are connected to the flow regulator(s).

Thus, preferred embodiments of the present invention provide an improved toilet and flushing system which may have the following advantages:

- a) is substantially quiet in its flushing operation;
- 25 b) only requires a small volume of water to flush the toilet;

WO 03/058002

PCT/NZ02/00222

11

- c) does not require a cistern to operate;
- d) is capable of connecting directly to a mains water supply.

### **BRIEF DESCRIPTION OF DRAWINGS**

Further aspects of the present invention will become apparent from the ensuing description which is given by way of example only and with reference to the accompanying drawings in which:

Figure 1 shows a schematic side view of one preferred embodiment of the present invention.

Figure 2 shows a schematic cross-sectional view of the base of the toilet system of Figure 1.

Figure 3 shows a schematic plan view of the toilet bowl of the toilet system of Figure 1.

Figure 4 shows a transverse cross-sectional schematic view of the rim of the toilet along the plane of line E-E on Figure 3.

Figure 4 shows a longitudinal cross-sectional schematic view of the rim of the toilet bowl along the plane of line F-F on Figure 3.

### **BEST MODES FOR CARRYING OUT THE INVENTION**

With respect to the drawings there is shown an improved toilet and flushing system generally indicated by arrow 1. The toilet and flushing system has a toilet bowl 2, water 3 supplied via conduit connected to a mains water supply (not shown) having a pressure of substantially between 30 and 70 PSI. The toilet bowl 2, has one bottom outlet 4, and three top outlets 5 and a waste channel 9. The flow of water 3 from the mains water supply is regulated by solenoid valves 7 and 8, such are commonly used in conventional dishwashers which have an inlet and outlets. The solenoid valves 7 and 8 are connected

WO 03/058002

PCT/NZ02/00222

12

via wires 71 and 81 to a control device in the form of an electronic timer 6, such as a two cycle output timer.

In operation when the electronic timing device 6 is activated by depressing a switch 10 the electronic timing device 6 opens the solenoid valve 7 so that water 3 can be supplied via conduit 11 to the bottom outlet 4. The valve 7 remains open for a set period of time, preferably substantially 8 seconds so that the water and waste residing in the base of the bowl can be evacuated, via the venturi effect, into the waste channel 9. The electronic timing device 6 then closes the solenoid valve 7 and opens solenoid valve 8 for a set period of time, preferably substantially 3 seconds, to provide water to the top outlets 5 via conduit 12. The three top outlets 5 direct water onto the walls of the bowl 2 thereby rinsing the sides of the bowl 2. The solenoid valve 8 remains open until sufficient water has filled the base of the bowl to the desired level indicated by double headed arrow X. In general, the level indicated by arrow X is approximately 10 cm above the base of the bowl 2. The electronic timing device 6 then closes solenoid valve 8 to complete the flushing cycle.

Figure 2 shows a detailed cross-sectional view of the base of the toilet bowl 2. The bottom outlet 4 is positioned within the base of the toilet bowl 2. The bottom outlet has been configured so water 3 exiting the outlet is directed onto the back of bowl 2 at point A, which is approximately 5 cm above the position of the bottom outlet 4. As can also be seen the bottom outlet 4 has an opening with a diameter that is reduced with respect to the diameter of conduit 11 so as to help create a venturi. Then inventor has also found that the venturi effect is further enhanced when the outlet 4 is directed at point A, on the back wall of the bowl towards the P (or S) trap. The effect of the venturi is to evacuate water and waste as described above to empty the bowl 2.

Figure 3 is a plan view of the toilet bowl 2. The conduit 12 is positioned around the top of the bowl so that it can provide water to the three top outlets 5 which are positioned at regular intervals around the bowl 2. When water 3 exits the top outlets 5 and is directed at an angle down onto the wall 23 of the bowl 2 and also around the bowl in the

WO 03/058002

PCT/NZ02/00222

13

direction of dotted arrows 3 so as to create a circular (swirling) flow of water around wall 23.

Figures 4 and 5 respectively show a transverse (refer line E-E) and longitudinal (refer line F-F) cross-sectional views of the rim of the toilet bowl shown in Figure 3. As can be seen the conduit 12 is integrally formed as part of the rim 22 of the bowl 2. However, it should be appreciated that the conduit 12 may in some embodiments be fitted to the rim and attached via clips, adhesive or other suitable fastening means. The outlets 5 are angled so as to:

- a) direct water 3 as indicated by the dotted arrow onto the wall(s) of the bowl 2 (refer figure 4); and
- b) direct water as indicated by arrow B so that it exits the outlet 5 in a substantially clockwise direction as indicated by dotted arrow 3 (refer figures 3 and 5).

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof as defined in the appended claims.

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